National and personal savings in the United States

Bovenberg, A.L.

Published in:
IMF Staff Papers

Publication date:
1990

IMF *Staff Papers*
Vol. 37, No. 3 (September 1990)

National and Personal Saving in the United States

Measurement and Analysis of Recent Trends

A. LANS BOVENBERG and OWEN EVANS*

An analysis of issues regarding the measurement of saving concludes that the observed declines in national, private, and personal saving rates in the United States cannot be attributed to measurement problems. Several factors that seem to have accounted for the decline in U.S. personal saving are examined. Structural changes in capital markets, as well as improvements in wealth positions, living standards of the elderly, and private and public insurance mechanisms have all contributed to the declining trend in personal saving. Empirical results suggest that demographic factors may also have played an important role. [JEL 023, 321]

THE LOW level of national saving in the United States has generated widespread concern because it has reduced the prospects for future U.S. income growth. It is also seen as having contributed to a sharp widening of the U.S. trade deficit in the 1980s. Although the fall in public saving associated with a widening budget deficit has been widely publicized, the private sector accounted for about an equal share of the fall in national saving, with a declining trend in personal saving explaining most of the weakening of the private saving performance.

* A. Lans Bovenberg, an Economist in the Fiscal Affairs Department when this paper was prepared, is currently on leave at the Ministry of Economic Affairs in the Netherlands. He is a graduate of Erasmus University in Rotterdam and received his Ph.D. from the University of California at Berkeley.

Owen Evans, Assistant to the Director in the Western Hemisphere Department, was a Research Fellow at the Brookings Institution before coming to the Fund. He is a graduate of the University of Sydney and received his Ph.D. from the University of Pennsylvania.

The authors are especially grateful to Yusuke Horiguchi and George Kopits for helpful comments.

This paper examines various issues relating to national and personal saving in the United States. Section I discusses how different components of national saving have evolved since 1950. Section II addresses several issues regarding the measurement of saving and concludes that the observed declines in national, private, and personal saving rates cannot be attributed to measurement problems.

Section III examines factors that seem to have been behind the decline in U.S. personal saving. It suggests that improvements in wealth positions, in the living standards of the elderly, in social security pensions, and in private and public insurance mechanisms may all have contributed to the declining trend. Demographic factors and structural changes in capital markets also appear to have played a role.

Section IV presents an empirical model of personal saving, in which demographic variables, the real after-tax interest rate, and the rate of inflation are important. According to simulation experiments, the changing demographic structure of the U.S. population appears to have played an important role in the declining personal saving rate in the 1980s. The rising ratio of wealth to disposable income and the decline in inflation were also significant, whereas the increase in the real interest rate mitigated the decline. Section V provides the conclusions.

I. Recent Trends in Saving

This section discusses recent trends in the most commonly used saving measures, which are derived from the National Income and Product Accounts (NIPA). Table 1 presents net saving relative to net national product (NNP) for the decade averages over 1950–89 and also annually since 1980. Net national saving comprises net public and private saving, with the latter consisting of personal and corporate saving. The state and local government surplus and the federal government surplus add up to total public saving.

The NIPA net national saving rate fell substantially in the 1980s to an average 3¼ percent from about 8¼ percent of NNP during 1950–79. Although rising dissaving by the public sector played an important role, falling private saving also contributed to the weakening national saving performance. The public and private sectors each accounted for about half of the decline in the NIPA net saving rate from 1950–79 to the 1980s.[1] The decline in the national saving rate was reflected in the widening imbalance between national investment and national saving,

[1] The decade of the 1980s covers the years 1980–89.

Table 1. *Saving and Investment,* 1950–88

Measure	1950–59	1960–69	1970–79	1980–89	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
	(In percent of NNP)													
Net national saving	8.1	8.6	7.9	3.3	5.8	6.4	2.3	2.2	4.6	2.7	1.7	1.7	2.9	3.2
Net private saving	8.2	8.9	8.9	6.2	7.2	7.5	6.2	6.5	7.7	6.4	5.6	4.4	5.2	5.4
Personal saving	5.2	5.1	6.2	4.3	5.6	5.9	5.5	4.3	4.9	3.5	3.3	2.5	3.3	4.4
Corporate saving	3.1	3.8	2.7	1.9	1.6	1.6	0.7	2.2	2.8	2.9	2.2	1.9	1.8	1.1
Net public saving	−0.1	−0.3	−1.1	−2.9	−1.4	−1.1	−4.0	−4.3	−3.1	−3.7	−3.8	−2.7	−2.2	−2.4
State and local surplus	−0.3	—	0.9	−1.4	1.1	1.3	1.3	1.6	1.9	1.8	1.7	1.3	1.1	0.9
Federal surplus	0.1	−0.3	−1.9	−4.3	−2.5	−2.4	−5.2	−5.8	−5.1	−5.5	−5.5	−4.0	−3.3	−3.2
Total net investment	8.2	7.7	7.6	5.1	5.5	6.2	2.3	3.5	7.4	5.8	5.3	5.3	5.4	4.7
Plant and equipment	3.4	3.7	3.7	. . .	3.7	3.6	2.4	1.5	2.7	2.9	2.0	1.6	2.0	. . .
Residential construction	3.8	2.9	3.0	. . .	2.2	1.7	0.8	2.2	2.7	2.6	3.1	2.9	2.7	. . .
Inventory accumulation	1.0	1.1	0.9	0.4	−0.3	0.9	−0.9	−0.2	2.0	0.3	0.2	0.6	0.6	0.6
Saving-investment surplus														
National saving-investment surplus	−0.1	0.8	0.3	−1.8	0.3	0.2	—	−1.3	−2.9	−3.1	−3.6	−3.5	−2.4	−1.5
Private saving-investment surplus	—	1.1	1.3	1.1	1.7	1.3	3.9	3.0	0.3	0.6	0.2	−0.8	−0.2	0.7
Net foreign investment	0.1	0.7	0.3	−1.8	0.5	0.4	—	−1.1	−2.7	−3.2	−3.6	−3.7	−2.7	−2.1

					(In percent of GNP)									
Memorandum items:														
Capital consumption allowances	8.7	8.4	9.6	11.1	11.1	11.4	12.1	11.6	11.0	10.9	10.9	10.8	10.5	10.6
Gross national saving	16.1	16.3	16.7	14.1	16.2	17.1	14.1	13.6	15.1	13.3	12.4	12.2	13.2	13.4
Gross private saving	16.2	16.6	17.6	16.6	17.5	18.0	17.6	17.4	17.9	16.6	15.8	14.7	15.1	15.4
Gross personal saving[a]	8.7	8.3	9.5	8.1	9.5	9.7	9.5	8.4	8.6	7.3	7.1	6.3	6.9	7.9
Gross corporate saving[b]	7.4	8.3	8.1	8.5	8.0	8.3	8.1	9.0	9.2	9.2	8.8	8.4	8.2	7.5
Gross public saving	−0.1	−0.3	−1.0	−2.5	−1.3	−1.0	−3.5	−3.8	−2.8	−2.3	−3.4	−2.4	−2.0	−2.0
National saving measured by changes in wealth[c]	11.6	9.7	7.4	. . .	12.8	−0.1	−3.7	10.4	1.9	13.9	10.5	5.9	. . .	. . .
					(In percent of personal disposable income)									
Personal saving rates														
National accounts basis	6.8	6.7	8.0	5.4	7.1	7.5	6.8	5.4	6.1	4.4	4.1	3.2	4.2	5.4
Flow of funds basis	8.5	7.7	8.4	6.8	7.0	7.9	7.9	8.3	8.3	5.3	6.2	5.1	5.5	6.5

Sources: United States Department of Commerce, *National Income and Product Accounts,* and Federal Reserve Board, *Flow of Funds Accounts.*

[a] Net personal saving plus noncorporate capital consumption allowances.

[b] Net corporate saving plus corporate capital consumption allowances.

[c] The figure for each year was computed as the ratio of the change in the sum of household and government net worth to GNP. Decade averages were computed as the average of the ratios for individual years. Data were reported in Bradford (1989).

and in the increased reliance on foreign saving, which reached a peak of almost 4 percent of NNP in 1987. Moreover, whereas private saving traditionally provided sufficient funds to finance private investment in the post-1950 period, the private saving-investment surplus fell after 1982 and turned negative in 1987 and 1988.

A declining trend in the personal saving rate explained most of the fall in the private saving rate. The net personal saving rate as a percentage of NNP declined from its historical average of about 5½ percent in the beginning of the 1980s to about 3 percent in 1987–88, before increasing somewhat in 1989. Net corporate saving also declined in the 1980s compared with earlier decades.

Gross private saving as a share of gross national product (GNP) is presented as a memorandum item in Table 1. In contrast to the share of net private saving in NNP, which started to fall in the mid-1970s, gross private saving as a proportion of GNP has remained relatively stable within a range of 15½ to 18 percent during the 1950–85 period. Nevertheless, after reaching a postwar high by the end of the 1970s, this saving measure has also declined recently, especially since 1984, averaging 15 percent of GNP in the period 1987–89—the lowest levels since the 1940s.

Diverging trends in gross and net measures of saving point to important changes in depreciation rates. In fact, the share of depreciation in GNP rose significantly at the end of the 1970s and the early 1980s. This rising trend was due in part to a slowdown in productivity growth, which raised the capital output ratio. More importantly, it reflected a shift in the pattern of nonresidential investment away from longer-lived assets, such as structures, toward shorter-lived assets, especially information processing equipment.[2] Although technological change may have contributed to the change in the composition of investment toward shorter-lived assets, taxation played a significant role as well. Several studies suggest that tax rules, especially when the rate of inflation was high, have typically favored equipment over structures.[3]

Although net saving is the relevant concept for measuring the accumulation of wealth and the intertemporal allocation of consumption, gross saving is also an important measure. In particular, a higher rate of gross

[2] Corker, Evans, and Kenward (1989) and Evans (1989) discuss in more detail recent movements in the composition of corporate investment, including the increase in the investment share of assets with relatively low service lives. See also de Leeuw (1989).

[3] See, for example, Bosworth (1981), Gravelle (1983), and King and Fullerton (1984). Other studies have argued that additional uncertainty associated with higher and more variable inflation rates and anticipated larger fiscal deficits have raised long-term real interest rates relative to short-term real rates, thereby shifting the investment mix toward shorter-lived assets.

saving may lead to more rapid economic growth if technical change is embodied in new capital goods or if introducing new capital generates significant learning-by-doing effects. Moreover, gross saving measures tend to be more reliable than net saving measures, because, in contrast to measures for net saving, they do not rely on estimates for depreciation, which are subject to various statistical and conceptual problems. Nevertheless, the rest of this paper focuses on the net saving concept in view of its focus on the accumulation of wealth and intertemporal consumption decisions.

II. Alternative Saving Measures

Aghevli and others (1990, Appendix I) deal with several issues regarding the measurement of national saving and its components in an international context. This section examines some of these measurement issues in the context of the United States and presents alternative measures to test whether the decline in U.S. saving as reported by the NIPA is confirmed if saving is measured in alternative ways. Measurement issues that affect national saving as the aggregate measure of household, business, and public saving are examined first, followed by a look at statistical issues that primarily affect the allocation of national saving among the household, business, and public sectors.

Measurement Errors and Personal Saving

When preparing the NIPA, the Department of Commerce measures personal saving as a residual from much larger figures. It estimates saving from the sources side of income by subtracting personal outlays from personal disposable income. Measurement errors in each of these components may be quite large relative to net saving.[4] In particular, income earned in the underground economy tends to escape the NIPA income measure,[5] suggesting that this saving measure may underestimate actual saving.

Another official measure of personal saving, which is conceptually equivalent to the NIPA measure, has generally yielded a somewhat

[4] In recent years, the personal saving rate has generally been revised substantially after a preliminary annual figure is first published in January of the subsequent year. To illustrate, the average upward revision of personal saving in percent of disposable income amounted to 1.6 percentage points over the period 1976–80.

[5] Most consumption, in contrast, is measured accurately.

higher estimate. This measure, which is prepared on the basis of flow of funds data gathered by the Federal Reserve, focuses on the uses to which wealth is put, as reflected in the data for household assets and liabilities. The Federal Reserve estimates net financial assets held by households as a residual from the financial assets position of other sectors. This procedure may lead to an upward bias in the flow of funds estimate of personal saving, because increases in assets held in the United States by nonresidents are most likely underestimated due to the owners' desire for anonymity. Therefore, it may erroneously attribute the ownership of some asset accumulation by nonresidents to domestic residents.[6]

The nature of the measurement errors suggests that the actual personal saving rate lies between the values reported by the Department of Commerce and the Federal Reserve. Based on the analysis of quarterly fluctuations, de Leeuw (1984) argues that the NIPA measure is probably more reliable. Bosworth (1981, pp. 65 and 181) arrives at the same conclusion in view of the severe difficulties in tracing the ownership of financial assets. In any event, the household saving rate measured on the basis of flow of funds data also shows a downward trend in the 1980s.

Consumer Durables and Public Investment

Another problem with the traditional saving measure is that it excludes household purchases of nonresidential consumer durables and government spending on capital goods. Boskin, Robinson, and Huber (1989) provide more comprehensive measures of saving that include these items. At the same time, they account for the imputed rental flow of services from these assets as consumption and income. Table 2 contains some of their results.[7] The first row reports net national saving on an NIPA basis. The second row adjusts these by counting all public nonmilitary capital formation as saving. These data reveal that not only private saving but also public investment has trended downwards in the past three decades.

A more comprehensive saving measure, which is reported in the third row adds nonresidential consumer durables and nonmilitary government

[6] The bias in the Federal Reserve measure for household saving is thus closely related to the discrepancy in the U.S. balance of payments.

[7] Their measures need to be interpreted with caution because the adjustments are subject to large measurement errors. To illustrate, the rental flow on durables and public capital is computed as the product of the capital stock and a real opportunity cost, which is difficult to measure. Moreover, separating public expenditures into consumption and investment is difficult.

Table 2. *Various Measures of Net National Saving Rates, Selected Years*
(In percent of NNP)[a]

Measure	1950	1960	1970	1980	1985
NIPA measure	11.7	8.2	6.2	7.7	4.7
Including public nonmilitary investment in fixed reproducible capital	13.2	10.6	8.2	8.5	5.5
Including public nonmilitary investment in fixed reproducible capital and consumer durables	14.6	10.9	8.8	8.7	7.0

Source: Boskin, Robinson, and Huber (1989).
[a] Net national product (NNP) has been adjusted to include the value of imputed asset services.

capital, which raises the saving rate somewhat. Nevertheless, even with this extended definition, net saving as a proportion of NNP fell by half between 1950 and 1985.[8] Moreover, savings in the form of consumer durables (including residential investment) are different from savings in the form of financial assets. In contrast to financial savings, savings in durable goods absorb real resources within the personal sector. Consequently, they are not available for reducing the imbalance between national investment and saving,[9] or for financing investment in plant and equipment in the corporate sector. The before-tax return on these latter investments is likely to exceed the return on consumer durables in view of differential tax treatment; whereas the return on financial assets (through which the household sector helps to finance investment in the corporate sector) is taxed at both the personal and corporate levels, the imputed return on consumer durables remains tax exempt.

[8] Whereas including consumer durables does not greatly affect the time trend in saving, it may affect international comparisons of saving behavior. Lipsey and Kravis (1987) show that the United States invests more heavily in consumer durables than other industrial countries do. In comparing saving behavior in the United States to that in Japan, several studies, including Boskin and Roberts (1986) and Hayashi (1986), confirm this finding. More generally, Lipsey and Kravis (1987) argue that the United States channels a relatively high share of its capital formation through the household sector. They maintain, for example, that high personal tax rates in other industrial countries provided an incentive to substitute cars provided by employers, which are counted as producer durables, for cars owned by households, which are consumer durables.

[9] If measured saving is raised by reclassifying consumer durables and public investment as domestic saving, domestic investment is also increased. Therefore, the saving-investment balance is unaffected.

Capital Gains and Losses

The NIPA saving measures exclude accrued real capital gains and losses, although these gains and losses may represent changes in net wealth. As advocated by Shoven (1984), some studies have included capital gains in a single comprehensive measure of saving by using the Federal Reserve's balance sheets for the U.S. economy. Bradford (1989), for example, has argued that a measure of saving based on changes in wealth corresponds more closely to the relevant theoretical concepts. As with Shoven's earlier work, the resulting saving series were highly volatile from year to year and difficult to interpret. Nevertheless, the declining trend in aggregate saving relative to income reflected in the national accounts data is also evident in wealth-based measures (Table 1). Thus, although exact magnitudes may differ according to the employed concept, the broad picture of a declining national saving rate remains.

Some have argued in favor of separately accounting for capital gains rather than including them in a comprehensive saving measure. In their view, the behavioral effects associated with income in the form of capital gains are rather different from those associated with other income. Summers and Carroll (1987a), for example, suggest that the marginal propensity to save out of stock market capital gains is close to unity and much larger than that out of other income. Furthermore, as Hendershott and Peek (1985b) show, the effects of capital gains on the well-being of the asset holder depends both on the intent of the asset owner and on the life of the asset. If the asset holder intends to hold the asset until the end of its useful life (as is the case for many consumer durables), capital gains may fail to improve his or her position. In fact, the owner may lose from capital gains if he or she intends to replace the asset, because capital gains are likely to be associated with higher replacement costs.

Inflation

The NIPA measures fail to adjust saving measures for inflation by recording all nominal interest receipts as income. During inflationary periods, however, the inflation premium in interest rates amounts to a repayment of the principal that creditors must set aside to maintain the real value of their wealth. Therefore, only the real interest component of the nominal interest receipts should be counted as income (see, for example, Jump (1980)). On the one hand, the NIPA measures understate saving by the public and corporate sectors if inflation is positive

because these sectors typically are net debtors. On the other hand, personal saving is overstated because households generally are net creditors.

Table 3 indicates that inflation-adjusted personal saving in the 1980s remains significantly below that of two decades earlier, with most of the decline occurring in the 1970s rather than the 1980s.

Pensions

Corporate pensions raise another issue regarding the allocation of saving between the corporate and household sectors. The NIPA measures treat all contributions to pension plans and income earned by these plans as personal income. Most corporate pension plans, however, are defined benefit plans in which employers commit themselves to providing retired workers with a stream of income that does not bear a relationship to the corporate plan's asset position. Therefore, assets in defined benefit plans are effectively assets of the corporation, because the funding of these plans affects neither the firm's liability nor the value of the employee's asset.

Table 3 adjusts the standard measures of saving for inflation and pensions. The inflation-adjusted series for private saving, which appears in the fourth row, shows a pronounced downward trend from the mid-1960s to the end of the 1970s.[10] The declining inflation rate in the 1980s, however, has been accompanied by a more stable series for adjusted private saving. In particular, the inflation-adjusted series for personal saving suggests that the reduction in inflation in the 1980s has been an important factor behind the fall in the NIPA personal saving rate during this period. Consequently, the inflation-adjusted series attributes more of the decline in national saving over the 1980s to public saving than the NIPA series does.

The pension and inflation corrections raise the corporate share in private saving. According to this measurement, the average personal saving rate from the mid-1970s to the mid-1980s was actually slightly

[10] Inflation-adjusted saving is computed by subtracting from NIPA saving the product of the inflation rate (as measured by the GNP deflator) and net interest-bearing assets. Hendershott and Peek (1987) criticize this procedure for two reasons. First, the procedure assumes immediate adjustment of interest income to the current anticipated inflation rate. In fact, interest income adjusts only slowly, especially if a significant part of fixed coupon assets and liabilities are long term. Second, the procedure ignores tax liabilities incurred on nominal interest income. In view of these two reasons, the inflation-adjusted series probably overestimates the effect of inflation on saving measures.

Table 3. *Composition of National Saving*
(In percent of NNP)

Measure	1951–55	1956–60	1961–65	1966–70	1971–75	1976–80	1981–86	1951–86
Net public saving								
NIPA	−0.5	−0.2	−0.4	−0.6	−1.3	−0.9	−3.3	−1.1
Inflation adjusted	0.3	1.1	0.4	0.9	1.1	1.7	−1.7	0.4
Net private saving								
NIPA	8.1	8.3	9.0	8.9	9.3	8.3	6.7	8.3
Inflation adjusted	7.2	7.0	8.1	7.3	7.0	5.8	5.3	6.7
Net personal saving								
NIPA	5.1	5.2	5.0	5.4	6.7	5.5	4.6	5.4
Pension adjusted	4.5	4.5	4.2	4.5	5.6	3.9	3.2	4.3
Inflation adjusted	3.6	3.0	3.2	2.2	1.7	−0.6	0.5	1.8
Net corporate saving								
NIPA	3.1	3.0	3.9	3.5	2.6	2.8	2.1	3.0
Pension adjusted	3.7	3.8	4.8	4.4	3.7	4.4	3.5	4.0
Inflation adjusted	3.7	3.9	4.9	5.0	5.3	6.4	4.8	4.9

Source: Summers and Carroll (1987a).

negative. In fact, personal saving accounts for most of the long-term secular decline in the adjusted private saving series.

Social Security

The NIPA measures treat benefit payments from state and local government pensions and from social security as private disposable income and regard contributions to these plans as public saving rather than private saving. Official measures of private saving thus fail to account for the accumulation of social security wealth by the private sector. At the same time, public saving does not reflect the pension liabilities that the Government incurs.[11] Under this approach, social security contributions are viewed as payroll tax payments, whereas benefit payments are regarded as transfers from a social entitlement program—rather than as contributions to, and payments from, a pension fund.

Blades and Sturm (1982) and Hendershott and Peek (1987) adjust private and public saving for the effects of social security Old-Age and Survivors Insurance (OASI) on the assets and liabilities of the private and public sectors.[12] If the Government had recorded social security contributions as payments for the purchase of social security bonds, which indicate the prospective claim by the private sector on the social security system, the Government would have recorded deficits in excess of $300 billion in several of the previous 20 years. Estimates of the unfunded social security liability owed by the Government to the private sector exceed estimates of the Government's official debt liabilities.

If social security contributions are to be included in a measure of private saving, they perhaps should be accounted for separately.[13] Future social security benefits are not contractual obligations in the same way as regular public debt instruments are, because they cannot be traded in a marketplace and because Congress can modify social security benefits

[11] To illustrate, the state and local government surpluses largely reflect the cash flow surplus of pension funds, which are simultaneously accruing future liabilities.

[12] According to Auerbach and Kotlikoff (1987) the "pay-as-you-go" financing of the U.S. social security system provides an example of the arbitrary nature of government accounting. They argue that current accounting definitions provide a misleading guide as to whether certain government receipts should be labeled as taxes and others as borrowing, or whether certain public outlays are spending or repayment of loans. According to them, indicators of fiscal policy should focus on their ultimate impact on household budget constraints.

[13] Similarly, the Government should not add its social security liabilities to its regular national debt. Instead, it could provide separate supplemental information concerning its potential future liabilities on account of social security.

by changing the benefit formulas.[14] Also, estimating social security wealth as perceived by the private sector is a highly complicated exercise that depends on a variety of necessarily tenuous assumptions.

This section has discussed various issues regarding the measurement of saving. Although counting consumer durables and government investment as saving raises the level of national saving somewhat, the main observation derived from the NIPA series is that net national saving in the United States has trended downwards over the last two decades chiefly because of three forces. First, and most important, public saving fell sharply in the 1980s. Second, private saving has been on a downward trend since the early 1960s, mainly due to declining personal saving. Third, depreciation allowances have risen since the mid-1970s.

III. Explanations for Downward Trend in Personal Saving

This section examines several possible explanations for the downward trend in the U.S. personal saving rate. The approach taken is eclectic, in the sense that is borrows from various theories on the determinants of personal saving. In particular, it allows for various motives for saving, such as saving for retirement and bequests, as well as precautionary saving and target saving for the purchase of major consumer durables.[15]

Wealth Effects

According to the life-cycle hypothesis, individuals reduce their savings if capital gains improve their net wealth positions;[16] this effect is especially important for the elderly. Thus far in the 1980s (1980–88), household wealth has averaged 4.4 times disposable income compared with 4.2 times in the 1970s, an increase that would be likely to lead to a fall in the household saving rate.

Rising stock market values added significant amounts to household wealth during the period 1982–87. Moreover, they enabled employers to

[14] Policymakers can also change the real return on regular debt instruments by affecting the rate of inflation. However, characteristics of regular debt instruments with respect to inflation risks are likely to be different from those of social security benefits.

[15] For a survey of various saving theories, and the life-cycle hypothesis in particular, see Aghevli and others (1990) and Bovenberg and Evans (1989). Smith (1990) explores various determinants of saving in industrial countries.

[16] *The Annual Report of the Council of Economic Advisers* (United States (1987, pp. 43–45)) stresses rising real household wealth as a factor behind the low rate of personal saving out of current income.

contribute less to their defined benefit pension plans and still meet their pension obligations. In effect, pension funds act like pure target savers. Hence, a rising rate of return yields a negative income effect without any offsetting positive substitution effect.[17]

The stock market boom may have reflected at least two factors. First, rising corporate saving in the early 1980s (see Table 1) tended to raise share values. Some studies suggest that corporate saving substitutes for personal saving mainly through this channel.[18] Second, more optimistic expectations regarding future profitability of corporate assets, due to both more efficient structural policies (such as tax reform increasing overall efficiency) and declining inflation rates, may also have contributed to higher stock prices.[19]

The sharp increase in housing prices in the inflationary period of the mid-to-late 1970s is likely to have had a significant negative effect on the personal saving rate. Summers and Carroll (1987a) suggest that the adverse saving effect of rising housing wealth exceeds that of rising stock market wealth. Two factors may explain this empirical result. First, households often borrow against appreciated properties.[20] Second, the elderly, who are generally characterized by a larger marginal propensity to consume out of an increase in wealth, tend to realize most of the capital gains on housing.

Several studies attributed the housing boom in the second half of the 1970s to accelerating inflation that raised tax incentives favoring housing. Summers and Carroll (1987b), for example, compare the saving performance of the United States with that of Canada, which does not allow tax deductibility of mortgage interest payments. They show that increasing inflation rates widened the gap in after-tax real interest rates on mortgages between Canada and the United States to 8 percentage points by 1981. The diverging tax incentives caused housing prices in the

[17] Bernheim and Shoven (1985) estimate that this effect reduced personal saving by about 2 percent of disposable income from 1982 to 1984.

[18] See, for example, Hendershott and Peek (1987). Aghevli and others (1990), Bovenberg (1989), and Smith (1990) discuss the relationship between personal and corporate saving in more detail.

[19] More generally, saving declines if households come to believe that structural policies will bring about higher future income because of a more efficient use of resources and higher overall productivity. Within the group of seven major industrial countries, the household saving rate fell most sharply during the 1980s in the United States and the United Kingdom, which were the two countries that implemented most of the structural reforms during this period. Tanzi and Bovenberg (1989) discuss how structural policies may affect saving, investment, and international capital flows.

[20] The recent increase in home equity loans illustrates this.

United States to rise relative to those in Canada,[21] and thus may have depressed the relative saving performance of the United States.

Empirical studies generally suggest that movements in wealth are a major determinant of saving behavior. Hendershott and Peek (1985b) find that wealth and income are the most important variables explaining long-run swings in personal saving. In particular, rising wealth explains most of the decline in the private saving rate during the period 1975–82. Empirical results in Montgomery (1986) indicate that increases in wealth and in expected future income relative to current income account for about 40 percent of the fall in the personal saving rate during this period.

Social Security Pensions and Improvements in Living Standards of the Elderly

Retirement benefits from social security currently represent almost 5 percent of GNP and are projected to increase rapidly in the decades ahead as the share of retirees in the population rises. The ratio of the average social security benefits per elderly person to per capita disposable income rose from 2 percent in 1950 to 30 percent in 1970 and reached 40 percent in 1985 (Table 4). The present value of prospective social security benefit payments now represents about a third of the wealth of the elderly (see, for example, Shoven (1984)).

Social security, which amounts to a compulsory public pension scheme, affects private saving through a number of channels. First, the expansion of the scheme redistributed income toward the elderly,[22] who have a relatively large marginal propensity to consume.[23] Second, the life-cycle model predicts that anticipated social security pensions reduce the need for private retirement saving, although an increased incentive to retire earlier may partly offset the weakened motive for private saving. Moreover, Hubbard (1984, 1986) demonstrates that social security pensions provide insurance for retirement consumption in the face of uncertain life spans. In particular, these pensions reduce the uncertainty regarding the necessary amount of saving for retirement. Thus, these

[21] Housing demand strongly affects the value of real estate because the supply of housing is inelastic in the short run.

[22] Those who retired in the past several decades and those who will retire in the near future can expect to receive a return on their social security contributions that significantly exceeds the return they would have received on investments in financial markets. Those who are currently entering the work force, in contrast, cannot expect to receive as much in return for their social security contributions as they could obtain by investing in financial market instruments.

[23] Evans (1983b) emphasized this channel.

Table 4. *Relative Income of the Elderly and Nonelderly, Selected Years*

(In percent)

Year	Ratio of Median Incomes[a]		Ratio of Poverty Rates[b]	Social Security Payment-Income Ratio[c]
	Men	Women		
1950	0.35	0.49	. . .	0.02
1955	0.34	0.46	. . .	0.05
1960	0.34	0.44	1.7[d]	0.26
1965	0.33	0.44	2.1[e]	0.27
1970	0.35	0.43	2.2	0.30
1975	0.41	0.55	1.3	0.37
1980	0.42	0.67	1.2	0.40
1985	. . .	. . .	0.9	0.40

Source: Summers and Carroll (1987a).

[a] Median income of the elderly divided by median income of the nonelderly. Data for odd years are averages of preceding and following even-year data.

[b] Poverty rate of the elderly divided by poverty rate of the nonelderly.

[c] Ratio of average social security payment per elderly person to per capita disposable income.

[d] Data are for 1959.

[e] Data are for 1966.

pensions could depress precautionary saving, thereby reinforcing the adverse effects of social security on life-cycle saving.

Empirical studies on the effect of public pension schemes on personal saving, which date back to Feldstein (1974), are inconclusive and are hampered by numerous methodological difficulties.[24] Summers and Carroll (1987a) argue that studies of year-to-year movements in consumption cannot provide much insight on the saving effects of social security, because these effects depend on perceptions about future benefits that are likely to respond slowly to legislative changes.[25] They maintain that the gradual improvement in the relative income of the elderly (see Table 4), which is largely due to the sharply increasing social security benefits over the last three decades, has reduced the perceived need of younger generations to save for retirement. With their recollec-

[24] Smith (1990) surveys the main empirical studies in this area. Aghevli and others (1990) examine the interaction between social security, its financing, and national saving.

[25] The recent restructuring of the social security system that put the Old Age Survivors and Disability Insurance (OASDI) on a sounder financial footing provides an interesting example of this point. If the younger generations gradually come to believe that the OASDI is more financially sound than originally believed, they may reduce their retirement saving over time.

tion of the depression and World War II, the older generations feel a greater need to save for retirement as a buffer against risk. Summers and Carroll argue that this is probably the single most important factor explaining the secular decline in the private saving rate over the last two decades.[26] Boskin and Lau (1988) provide some empirical support for these arguments. They show that, holding all other variables (including age) constant, the saving rate of households headed by persons born before 1939 significantly exceeds the saving rates of those cohorts of households headed by persons born after 1939.

Despite empirical difficulties in measuring the saving impact of social security pensions, Boskin (1988) argues that the consensus from the empirical literature is that each dollar of social security wealth, measured as the discounted value of social security benefits, depresses private wealth by about $0.25 to $0.50.

Improved Insurance

Insurance arrangements directly enhance the ability of households to guard against uncertainty and, therefore, reduce the need for precautionary saving.[27] The previous subsection noted that social security pensions insure against uncertainty about life span, thereby reducing the need for private precautionary saving. In addition to annuity insurance, various other types of insurance—including unemployment insurance, disability insurance, and health insurance—have substantially improved in the postwar period. These improvements may also have reduced precautionary saving.

Most of this growing insurance has been provided by the public sector through social programs, such as Medicare, which covers health care for the elderly, and Medicaid, which pays for the health care of low-income individuals,[28] both introduced in the mid-1960s. Health care spending through these programs has increased to almost 2.5 percent of GNP.

[26] Summers and Carroll (1987a) observe that a slight worsening of the relative income position of the elderly accompanied rising private saving rates in the 1950s. When the relative income of the elderly started to improve in the mid-1960s, private saving began to trend downward.

[27] Moreover, the introduction of actuarially fair insurance schemes can raise lifetime welfare if individuals are risk averse. This welfare effect may raise consumption and reduce saving.

[28] According to Kotlikoff (1986), the availability of Medicaid may substantially reduce saving of lower-income groups. For middle-income and upper-income households, in contrast, health expenditures still represent a major uninsured risk, thereby inducing significant precautionary saving by these income groups.

The adverse effect of improved insurance schemes on precautionary saving is mitigated by two factors. First, in the past the extended family provided implicit insurance (see, for example, Kotlikoff and Spivak (1981)), and to the extent that expanding explicit insurance schemes have replaced such implicit insurance mechanisms, they may not have reduced the need for precautionary saving. Second, rising costs of health care raised the need for precautionary saving. In fact, despite the increasing share of medical expenses covered by insurance schemes, the income share devoted to uninsured health care has not declined (see, for example, Summers and Carroll (1987a)).[29]

On balance, expanding public insurance schemes are likely to have reduced national saving despite some offsetting factors, especially because the public sector has failed to increase its saving in order to offset the adverse effects of its insurance programs on private saving.[30] In effect, a claim on future taxpayers was substituted for real capital formation.

Demographic Trends

According to the life-cycle model, the aggregate saving ratio depends on a number of demographic variables. One of these factors is the age distribution of households, because individual household saving ratios tend to vary with the age of the households. Households in the 20–35 age

[29] Feldstein (1986) argues that both improved social insurance and tax arrangements favoring private health insurance played a major role in raising health care costs by increasing demand for health services and reducing competitive pressures to keep medical costs down. As regards tax incentives, employer payments for health insurance are deductible for corporate tax purposes but are not included in the taxable income of employees. This tax rule, which reduces annual tax collections by about $30 billion, according to official estimates, substantially reduces the after-tax cost of purchasing health insurance. Through this provision, the tax system subsidizes precautionary private saving, while at the same time distorting the allocation of private saving.

[30] Evans (1990) attempted to calculate the magnitude of the federal fiscal surplus that might be desirable, given the low private saving rate. Other government programs that support higher education and home ownership may also replace private saving, and, if public saving is not increased, reduce national wealth accumulation. These effects on private saving illustrate an important point: the national saving effects of public expenditures are not limited to their budgetary costs and their direct effect on the budget deficit. Even if the Government prevents public expenditures from increasing the fiscal deficit through raising taxes, expenditures may depress national saving by reducing private saving. It may be noted that those public expenditures that may tend to reduce private saving, such as public retirement and disability programs, unemployment insurance, student aid, and housing assistance, account for much of the growth of public spending over the past 20 years.

group typically save a lower share of their disposable income than older households who have not yet retired.[31] This differential saving behavior arises because the members of the younger age group have not yet reached their peak earning levels, while they spend more on child rearing and on durable goods. The coming of age of the baby boom generation has increased the population share of the 20–35 age group during the past two decades, thereby tending to depress aggregate personal saving. At the same time, the population share of retired households, which are also characterized by relatively low saving rates, has risen as well. This trend has reinforced the adverse effects of the changing age distribution on total private saving.

Empirical studies suggest that the changing age composition of the population has significantly reduced aggregate saving over the past 20 years. Montgomery (1986), for example, estimates that the increasing population share of the 25–35 age group accounts for about a quarter of the decline in the personal saving rate during the 1975–82 period. Hendershott and Peek (1987) find that the rising share of the group aged 65 and older significantly depressed saving between 1953 and 1982. These empirical estimates need to be interpreted with care, however, because the demographic variables may capture effects of other, omitted, variables. According to Summers and Carroll (1987a), the variation in saving rates and income shares received by different age groups is insufficient to explain very large changes in aggregate saving rates. Furthermore, other demographic factors may act to (partly) offset the negative saving effect of the changing age composition. For example, the increase in life expectancy and the decline in the retirement age raise the need for retirement saving, because these factors lengthen the expected retirement period.

Other demographic variables affecting total personal saving are family size and the female participation rate in the labor force. As fertility has fallen, the average family size has been declining over previous years. This development has reduced the need to save for bequests, including implicit bequests in the form of expenses for child rearing and education. Some studies (see, for example, Sturm (1983)) have argued that the rising female participation rate contributed to the decline in saving both by increasing the access to consumer credit and by reducing the variability of incomes.[32]

[31] See also Aghevli and others (1990). According to the 1984 consumer expenditure survey, personal saving rates varied between minus 17 percent for the 18–24 age group and plus 13 percent for the 55–64 age group.

[32] The latter factor reduced the need for precautionary saving.

More Efficient and Integrated Capital Markets

Capital market imperfections reduce the availability of credit to certain sectors or segments of the population. These imperfections, therefore, limit the ability of young households to smooth their lifetime consumption by borrowing, thereby increasing aggregate saving. In addition, they raise target saving for the purchase of major consumer durables by forcing households to finance these purchases by accumulating a sizable down payment rather than by borrowing. If capital markets develop and become more efficient, some of the restrictions on borrowing are relieved and, consequently, aggregate saving may decline.[33] The size of the decline may be substantial during a transition period when liabilities adjust to a new structure of capital markets.

Several studies have attributed some of the decline in the personal saving rate over the past decades to increased credit availability for households.[34] Consumers have been taking on an increasing amount of debt. As a ratio of disposable income, consumer and mortgage credit have risen by about 50 percent since the mid-1950s. At the same time, the average down payment for first-time home buyers has fallen relative to median family income.

The increasing international integration of financial markets may have made a one-time contribution to the continued decline of the personal saving rate during the 1980s. The Japanese liberalization of capital outflows allowed U.S. individuals and corporations as well as public entities to borrow at lower after-tax interest rates than would have been the case if Japanese savings had not been made available to world capital markets.[35]

The process of corporate restructuring in the 1980s, which has produced windfall gains for households, is another channel through which financial innovation may have influenced saving behavior. To the extent that these windfall gains boosted consumption, they may have contributed to a decline in personal saving. Hatsopoulos, Krugman, and

[33] To the extent that more efficient capital markets raise rates of returns on financial assets, savers may raise their level of saving. More importantly, they may increase the share of financial assets in their portfolios. These positive effects on the accumulation of financial assets may (partly) offset the increase in financial liabilities. However, more efficient insurance markets are likely to decrease precautionary saving. See Hubbard and Judd (1986) and pp. 652–53.

[34] See, for example, Organization for Economic Cooperation and Development (1979), Bosworth (1981), Sturm (1983), and Summers and Carroll (1987a).

[35] Such liberalization can result in sizable capital flows during the transition to a new stock equilibrium. For a description of the Japanese liberalization measures, see Fukao (1988).

Poterba (1989) find this effect to be quite large, although the relevant coefficient is not statistically signficant at conventional levels. Fries (1989) finds statistically significant effects of this kind, but of smaller economic magnitude.

The Role of Real After-Tax Interest Rates

The importance of changes in real after-tax interest rates in the determination of household consumption and saving in the United States has long been a matter of controversy.[36] At a theoretical level, two-period life-cycle models indicate the existence of potentially offsetting income and substitution effects. Summers (1981) proposed that in a realistically formulated multiperiod life-cycle model, a large positive interest elasticity of saving was likely. Evans (1983a) countered by noting that Summers's results stemmed in part from a restrictive choice of parameters, and added that the incorporation of a bequest motive made a negative interest elasticity of saving plausible. At the empirical level, some studies (for example, Boskin (1978)) have suggested a significant positive effect of real after-tax interest rates on household saving, whereas others (for example, Friend and Hasbrouck (1983)) indicate an effect close to zero. Overall, no consensus appears to exist on the magnitude or significance of the effect.

Role of Inflation

As noted in Section II, inflation raises some issues of measurement. Inflation may also affect saving by reducing the real after-tax rate of return. However, inflation may raise personal saving through several other channels. In particular, personal saving may rise in an inflationary environment if consumers mistake nominal for real price increases (see, for example, Deaton (1977)). Furthermore, when inflation raises uncertainty regarding future incomes, risk-averse households may save more (see, for example, Sandmo (1970)). Inflation may also reduce consumption of indebted households that face liquidity constraints, because the inflation premium in nominal interest rates forces these households to accelerate the repayment of their real debt. Indeed, assuming a fixed real after-tax return, most empirical studies find that inflation significantly raises saving.[37]

[36] For a useful survey of the literature, see Smith (1990).

[37] For saving in the United States, see Blinder and Deaton (1985) and Montgomery (1986). For other industrial countries, see Dean and others (1989).

IV. An Empirical Analysis of Personal Saving

As noted in Section I, the personal saving rate in the United States has been very low in the last several years compared with earlier decades. In 1987 and 1988, it averaged 3½ percent of disposable income compared with just over 7 percent from 1950 to 1979 (Table 1). This section presents results from a simple empirical framework designed to assess the magnitude of some of the main influences on U.S. personal saving in the 1980s.

Estimation

According to the conventional permanent income, life-cycle hypothesis, aggregate consumption should be related to labor income and wealth, with a possible role also for real rates of return. In most empirical applications personal disposable income is used as a proxy for labor income. The coefficients on income and wealth in aggregate equations need not in principle be constant, but rather may themselves evolve gradually over time in response to demographic developments and other structural changes.

In the simple empirical framework to be presented below, the underlying long-run relationship reflects the life-cycle, permanent income approach, while a more agnostic view is taken of short-run adjustments around the long-run relationship. A flexible distributed lag model is estimated, using a testing-down procedure that drops statistically insignificant higher-order lags. The underlying approach is in the tradition of the error-correction models pioneered by Hendry and others (see Davidson and others (1978), Hendry, Pagan, and Sargan (1984), and Hendry (1986)). This approach has proven particularly fruitful in generating models consistent with observed data patterns and yet embodying the long-run relationships implied by economic theory.

Much previous empirical research on U.S. consumption and saving has estimated separate equations for pure consumption and spending on consumer durables, which were then linked in a small model. However, in this paper, consumer spending is modeled as an aggregate, without separate specifications for nondurables and services and durable goods. Darby (1975, 1977/78), among others, has argued that an overall consumer expenditure function may better represent the data and have superior predictive power compared with a disaggregated approach.

The results from estimating an aggregate equation for consumer spending are presented below.

$$\Delta \log C = \underset{(5.6)}{-0.379} \cdot \log C_{-1} + \underset{(5.7)}{0.310} \log Y_{-1} + \underset{(2.1)}{0.041} \log W_{-2}$$

$$+ \underset{(5.9)}{0.374} \cdot \Delta \log Y + \underset{(3.9)}{0.069} \cdot \Delta \log W_{-1}$$

$$- \underset{(5.9)}{0.0024} \cdot PIPC_{-1} - \underset{(3.9)}{0.00190} R_{-1}$$

$$- \underset{(2.4)}{0.00122} \cdot N20_{-1} - \underset{(2.9)}{0.00195} \cdot N2065_{-1}$$

$$+ \underset{(3.1)}{0.01272} \cdot N65_{-1}$$

$$\overline{R}^2 = 0.471 \qquad \text{SEE} = 0.0053.$$

The equation was estimated by ordinary least squares on quarterly data from 1960:1 to 1988:4. Notation is as follows:[38]

C = real per capita consumer spending
Y = real per capita disposable income
W = real per capita household net worth
$PIPC$ = four-quarter rate of inflation in terms of the consumption deflator
R = real after tax interest rate (defined as 1 minus a marginal tax rate[39] times the three-month Treasury bill interest rate less $PIPC$)
$N20$ = percentage share of the population below age 20
$N2065$ = percentage share of the population between the ages of 20 and 65
$N65$ = percentage share of the population over the age of 65
log = natural logarithm
$\overline{R}^2$ = adjusted coefficient of determination
SEE = standard error of the equation
Δ = first difference.

The numbers shown in parentheses are t-statistics.[40]

[38] The first three variables, C, Y, and W are deflated by the implicit deflator for consumer spending and population.

[39] The time series for the marginal tax rate was the average marginal tax rate for a four-person family on median family income, provided by the Office of Tax Analysis, U.S. Treasury.

[40] The equation was estimated in both PC-GIVE and AREMOS. The diagnostic tests were performed in PC-GIVE, and the simulation results (reported later) were generated in AREMOS. All data were taken from DRI data banks in June 1989.

Noteworthy features of the estimated equation (beyond the statistical significance of the income and wealth terms) are the strong statistical significance of the inflation rate, the real rate of interest, and the demographic terms.[41] Attempts were made to allow for an effect from the stock of consumer durable goods, but the variable did not enter significantly and was dropped. The estimated equation satisfies a range of diagnostic tests relating to serial correlation, heteroscedasticity, and non-normality of the error terms. When a standard Chow test of parameter stability was conducted (Chow (1960)), comparing the equation estimated on the period through 1980 to that estimated on the full sample through 1988, the hypothesis of parameter stability was not rejected.[42]

The long-run relationship that can be derived from the estimated equation is a follows:[43]

$$\log C = 0.819 \cdot \log Y + 0.108 \cdot \log W - 0.0063 \cdot PIPC - 0.0050 \cdot R - 0.0032 \cdot N20 - 0.0051 \cdot N2065 + 0.034 \cdot N65. \quad (1)$$

As a final step, the long-run relationship (from equation (1) above) was re-entered for estimation, to make the error-correction mechanism more transparent. The estimated equation was as follows:

$$\Delta \log C = \underset{(9.4)}{-0.381}\ (\log C_{-1} - \log C^*_{-1}) + \underset{(2.8)}{0.069} \cdot \Delta \log W_{-1} + \underset{(8.2)}{0.376} \cdot \Delta \log Y$$

$$\bar{R}^2 = 0.504 \qquad \text{SEE} = 0.0051$$

(sample period 1960:1 to 1988:4).

[41] In alternative estimated equations, not reported here, the term covering the population share between the ages of 20 and 65 was subdivided further without a major effect on the results.

[42] The calculated F-statistic was 1.08, distributed with (32,74) degrees of freedom; this is not significant at 5 percent. When a Chow test of coefficient stability was performed with the split in mid-1974—dividing the sample into equal halves—again the hypothesis of parameter stability was not rejected. The Chow test is known to be of low power, and passing such a test—although a necessary requirement for stability—is not sufficient to rule out the possibility of a break in behavior.

[43] By setting the difference terms to zero to obtain a steady state. If the difference terms are set to their average values over the sample instead, a small constant enters the long-run relationship.

Notation is as before and, in addition, C^* is the fitted value in the derived long-run relationship (equation (1)). The error correction term represents the gap between actual consumer spending last period and its long-run value. The estimated coefficient on this term (-0.38) indicates the proportion of the discrepancy in the previous period likely to be corrected in the current period.

The coefficients on income and wealth in the long-run equation can be directly interpreted as elasticities, while those on inflation and the real rate of interest are semi-elasticities. The inflation coefficient implies that a 1 percentage point increase in the steady-state inflation rate is likely to lead to a long-run decline in consumption of 0.6 percent compared with what it would otherwise have been; this result would in turn imply an increase in the saving rate by about ½ percentage point in the long run.[44]

The coefficient on the real rate of interest indicates that a permanent 1 percentage point rise in the real after-tax rate of interest would reduce consumption by ½ percent relative to its level otherwise, which in turn would lead to a rise in saving of about ½ percent of disposable income in the long run. The demographic variables are linked by an identity (they sum to 100 percent). Simple algebra reveals that if the proportion of the population over the age of 65 increases by 10 percent—from 10 percent of the population to 11 percent, for example—then the household saving rate would fall by almost 3 percent, according to the estimated results. This large effect of population aging on household saving is similar to that calculated by Greene (1989), but larger than that found by Masson and Tryon (1990; this issue) in a somewhat different framework.[45] The strong significance of the coefficient on the share of the population over the age of 65 could reflect more than pure demographic effects. For example, the increased share of disposable income accruing to older households—partially stemming from demographic effects but also from increased generosity of the social security system—could well exert a depressing effect on the saving rate, and might be picked up by this population term. The demographic terms, whose effects increase gradually over time, may also capture omitted trend-like influ-

[44] The coefficient on the real interest rate is very similar in size to that on the inflation rate. Thus may imply that consumption depends on nominal rates of return without much of an independent role for real rates of return and inflation. This finding is similar to that in Blinder and Deaton (1985).

[45] In contrast to the approach in this paper, Masson and Tryon (1990; this issue) assume that the effect of an increase in the dependency ratio on saving is the same, irrespective of whether the source is an increase in the share of the young or that of the over-65 age group.

ences on personal saving. Such effects are inevitably difficult to separate empirically in time series estimation.[46]

Simulation Results

The consumer expenditure equation was linked with identities to yield a simple model of personal saving for simulation purposes.[47] The model was then used for several illustrative simulation experiments. First, a baseline simulation was conducted over the period from 1970–88, to examine tracking performance. Then, several counterfactual experiments were conducted to examine the contributions of movements in the various explanatory variables in the 1980s.[48]

The results of the baseline and alternative simulations are presented in Table 5. The framework tracks the decline in the personal saving rate in the first half of the 1980s reasonably well, predicting a fall from an average 8 percent of disposable income in the 1970s to 3½ percent in the last three years (1986–88), compared with the movement from 8 percent to 3¾ percent of disposable income that actually occurred (columns (1) and (2) of Table 5). However, the saving rate was underpredicted by over ½ percentage point of disposable income in 1987 and 1988.

For ease of exposition, the simulations took 1981 as a reference point. In 1981 household wealth as a ratio to disposable income was relatively high (4.4 times disposable income). In the first counterfactual simulation, household wealth was kept at this level (relative to disposable income) to examine the effect on saving of movements in wealth.[49] According to the simulation results, the decline in the ratio of wealth to income in the remainder of the 1980s (with the exception of 1987) contributed to an increase in the household saving rate of between 0 and ½ percentage point (column 4 of Table 5). An alternative set of simulations (not reported here) indicated that compared with the 1970s, the *increase* in the ratio of wealth to income in the 1980s had reduced the household saving rate by ½–1 percentage point. The latter result is qualitatively similar to that found in other studies.

[46] Studies based on cross-section data tend to find smaller demographic effects (see Summers and Carroll (1987a) and Kotlikoff (1989)).

[47] The implicit deflator for consumer spending, disposable income, and the wedge between disposable income, consumer spending and saving (interest paid by consumers to business and personal transfers to foreigners) were all assumed exogenous at actual values, unless otherwise stated in the simulation.

[48] The counterfactual simulations were static, in the sense that feedback from saving to wealth was not incorporated. However, they were dynamic, in that, for simulation purposes, lagged consumer spending was treated as endogenous.

[49] From 1980 to 1988 household wealth averaged 4.38 times disposable income.

Table 5. *Saving Rates and Simulation Results*
(In percent of disposable income)

Period	Household Saving Rate		Contribution from[c]				
	Actual (1)	Baseline[a] (2)	Change from 1981[b] (3)	Wealth (4)	Inflation (5)	Real after-tax interest rates (6)	Demographic variables (7)
1970–74	8.5	8.2	0.7	0.4	−1.9	−0.8	3.0
1975–79	7.5	7.8	0.3	0.8	−1.0	−1.8	1.5
1980	7.1	6.9	−0.6	0.2	0.4	−1.5	0.2
1981[d]	7.5	7.5	—	—	0.5	−0.8	−0.1
1982	6.8	6.8	−0.7	0.2	−0.9	0.2	−0.4
1983	5.4	5.7	−1.8	—	−2.3	0.2	−0.8
1984	6.1	6.2	−1.3	0.3	−2.9	0.7	−1.1
1985	4.1	5.0	−2.5	0.4	−3.3	0.8	−1.5
1986	4.0	4.2	−3.3	0.1	−3.6	0.5	−1.8
1987	3.2	2.7	−4.8	−0.2	−3.6	0.1	−2.2
1988	4.2	3.5	−4.0	0.1	−2.9	−0.3	−2.6

Note: The simulation results employ the framework developed in Section IV.
[a] From a simulation with all explanatory variables at actual values.
[b] Difference between the baseline simulation for the given year and the saving rate in 1981.
[c] Difference between the baseline simulation and a simulation with the given explanatory variable at the average 1981 value. In the case of wealth, the wealth/income ratio was held at its 1981 value. The sum of the contributions of the explanatory variables (columns (4)–(7)) need not equal column (3) because of a nonnegligible interaction term.
[d] Some of the entries in the 1981 row are nonzero (contrary to intuition) because of lags.

In the next simulation experiment, the inflation rate (in terms of the implicit deflator for consumer spending) was held fixed at 9.3 percent (its 1981 average) compared with its actual path, which showed a decline from over 10 percent in 1980 to the neighborhood of 4 percent in 1987 and 1988. According to the results, the decline in inflation from almost 10 percent in 1981 subtracted 3½ percentage points from the personal saving rate in 1986 and 1987 and just below 3 percent in 1988 (column (5) of Table 5).

In 1981 the real after-tax interest rate[50] averaged 1½ percent, compared with 2 percent from 1982–88. The next simulation experiment held the real interest rate fixed at 1.4 percent. The results indicate that the higher real after-tax interest rate in this period added to the saving rate by ¼ to ¾ percentage point from 1982–86. The results also suggest that, other things being equal, the fact that the after-tax real interest rate averaged minus 1.7 percent in the 1970s compared with plus 1½ percent in 1981 contributed to a lower saving rate in the 1970s relative to its 1981 level by 1¼ percentage point.

In 1981 persons under age 20 averaged 33 percent of the U.S. population, those between the ages of 20 and 65 comprised 56 percent, and those aged 65 and over made up the remaining 10¾ percent. By 1988 the population share over age 65 is estimated to have risen to 11¾ percent, the under-20 share fell to 31 percent, while the share of the middle group increased to 57¼ percent. In the simulation experiment reported here, the demographic variables were held at their 1981 values, while other variables kept their actual values.[51]

According to the results, changes in demographic structure—especially the increasing proportion of the population over age 65, which has the largest estimated coefficient—contributed to a substantial decline in the household saving rate in the 1980s, with the magnitude of the effect drifting upward over time (column (7) of Table 5). By the last three years (1986–88), the household saving rate appears on average 2¼ percentage points of disposable income lower than if the average demographic structure from 1981 had remained in place.

As with all empirical research, the results presented here are model-specific. According to the empirical results, the largest contributing factor to the decline in the personal saving rate from an average 8 percent of disposable income in the 1970s to 7½ percent in 1981 and

[50] The experiment assumed that the inflation was fully foreseen, so that real income, real wealth, and real interest rates equalled historical values.

[51] This experiment is admittedly somewhat artificial since demographic shifts do not work independently of propensities to consume out of income and wealth, but rather should lead to gradual movements in these coefficients over time.

about 4 percent in the last few years is a change in the demographic structure—especially the rise in the share of the population over the age of 65. Demographic movements appear to have accounted for a decline in the saving rate of 2½ percentage points. This result needs to be interpreted with caution; as noted above, the demographic variables could pick up other trend-like influences on personal saving. The lower inflation rate in 1986–88 lowered the saving rate compared with the earlier period, whereas the higher after-tax real interest rate was associated with the saving rate being higher in 1986–88 than otherwise.

V. Conclusions

In the period 1986–89 the U.S. net national saving rate averaged just below 2½ percent of NNP, compared with 8¼ percent during 1950–79. The lower national saving rate was associated with a pronounced deterioration in public saving and a marked decline in net private saving, with the latter stemming primarily from a fall in the personal saving rate. Of course, it can be argued that national accounts measures of saving may be flawed in several ways. However, even after various adjustments are made to allow for alternative approaches to measuring saving, the central conclusions emerge unscathed—namely, that declines in both gross and net personal saving rates have contributed importantly to the observed reductions in national saving rates.

Empirical studies generally suggest that improvements in wealth positions associated with rising values of the stock market and housing have been an important factor behind the declining trend in personal saving. More generous social security pensions, improved public and private insurance, and larger government programs supporting higher education and home ownership may also have lowered national saving by reducing the need for personal saving. Furthermore, the changing age structure of the population and lower inflation may also have reduced the personal saving rate. Several studies have also attributed some of the decline in the personal saving rate to more efficient capital markets, which have reduced the need for target saving for the purchase of consumer durable goods. Available studies provide no consensus on the empirical importance of after-tax interest rates in the determination of personal saving, with results ranging from essentially zero significance to an important positive effect.

A simple empirical assessment suggested that demographic factors have played an important role in the decline in the personal saving rate; an improved wealth position relative to the 1970s and the decline in

inflation in the 1980s were also significant. The increase in real after-tax interest rates in the 1980s appeared to have moderated the fall in the personal saving rate.

REFERENCES

Aghevli, Bijan B., James M. Boughton, Peter J. Montiel, Delano Villanueva, and Geoffrey Woglom, *The Role of National Saving in the World Economy: Recent Trends and Prospects,* Occasional Paper 67 (Washington: International Monetary Fund, 1990).

Auerbach, Alan, and Laurence J. Kotlikoff, "An Examination of Empirical Tests of Social Security and Savings," NBER Working Paper 730 (Cambridge, Massachusetts: National Bureau of Economic Research, August 1981).

———, *Dynamic Fiscal Policy* (Cambridge, Massachusetts: Cambridge University Press, 1987).

Bank for International Settlements, *Fifty-Seventh Annual Report* (Basle: BIS, June 1987).

Bernheim, B. Douglas, and John Shoven, "Pension Funding and Saving," NBER Working Paper 1622 (Cambridge, Massachusetts: National Bureau of Economic Research, May 1985).

Blades, Derek W., and Peter H. Sturm, "The Concept and Measurement of Savings: The United States and Other Industrialized Countries," in *Saving and Government Policy,* Conference Series No. 25 (Boston: Federal Reserve Bank of Boston, 1982).

Blinder, Alan S., and Angus Deaton, "The Time Series Consumption Function Revisited," *Brookings Papers on Economic Activity: 2* (Washington: The Brookings Institution, 1985), pp. 465–521.

Boskin, Michael J., "Taxation, Saving, and the Rate of Interest," *Journal of Political Economy,* Vol. 86 (April 1978), S3–S27.

———, "What Do We Know About Consumption and Saving, and What Are the Implications for Fiscal Policy?" *American Economic Review,* Vol. 78 (May 1988), pp. 401–407.

———, and Lawrence J. Lau, "An Analysis of Postwar U.S. Consumption and Saving: Parts I and II," NBER Working Papers 2605 and 2606 (Cambridge, Massachusetts: National Bureau of Economic Research, June 1988).

Boskin, Michael J., and John M. Roberts, "A Closer Look at Saving Rates in the United States and Japan," Working Paper 9 (Washington: American Enterprise Institute, June 1986).

Boskin, Michael J., Marc S. Robinson, and Alan M. Huber, "Government Saving, Capital Formation and Wealth in the United States, 1947–85," NBER Working Paper 2352 (Cambridge, Massachusetts: National Bureau of Economic Research, August 1987). Reprinted in *The Measurement of Saving and Wealth,* ed. by R. Lipsey and H. Tice (Chicago: University of Chicago Press, 1989).

Bosworth, Barry P., *Tax Incentives and Economic Growth* (Washington: The Brookings Institution, 1984).

Bovenberg, A. Lans, "Tax Policy and National Saving in the United States: A Survey," *National Tax Journal,* Vol. 2 (June 1989), pp. 123–38.

———, and Owen Evans, "National and Personal Saving in the United States: Measurement and Analysis of Recent Trends," IMF Working Paper 89/99 (Washington: International Monetary Fund, 1989).

Bradford, David, "Market Value vs. Financial Accounting Measures of National Saving," NBER Working Paper 2906 (Cambridge, Massachusetts: National Bureau of Economic Research, March 1989).

Chow, Gregory C., "Tests of Equality Between Sets of Coefficients in Two Linear Regressions," *Econometrica,* Vol. 28 (July 1960), pp. 591–605.

Corker, Robert, Owen Evans, and Lloyd Kenward, "Tax Policy and Business Investment in the United States: Evidence from the 1980s," *Staff Papers,* International Monetary Fund (Washington), Vol. 36 (March 1989), pp. 31–62.

Darby, M., "Postwar U.S. Consumption, Consumer Expenditures, and Saving," *American Economic Review,* Vol. 65 (May 1975), pp. 217–22.

———, "The Consumer Expenditure Function," *Explorations in Economic Research,* Vol. 5 (Winter/Spring 1977/78), pp. 645–74.

Davidson, James, and others, "Econometric Modeling of Aggregate Time-Series Relationship Between Consumers' Expenditure and Income in the United Kingdom," *Economic Journal,* Vol. 88 (December 1978), pp. 661–92.

Dean, Andrew, and others, "Saving Trends and Behavior in OECD Countries," OECD Economics and Statistics Department Working Paper 67 (Paris: Organization for Economic Cooperation and Development, June 1989).

Deaton, Angus S., "Involuntary Saving Through Unanticipated Inflation," *American Economic Review,* Vol. 67 (December 1977), pp. 899–910.

de Leeuw, Frank, "Conflicting Measures of Private Saving," *Survey of Current Business,* Vol. 64 (November 1984), pp. 17–23.

———, "Interpreting Investment-to-Output Ratios: Nominal/Real, Gross/Net, Stock/Flow, Narrow/Broad," paper presented at the Carnegie-Rochester Conference on Public Policy (April 1989).

Evans, Owen (1983a), "Tax Policy, the Interest Elasticity of Saving, and Capital Accumulation: Numerical Analysis of Theoretical Models," *American Economic Review,* Vol. 73 (June), pp. 398–410.

——— (1983b), "Social Security and Household Saving in the United States: A Re-examination," *Staff Papers,* International Monetary Fund (Washington), Vol. 30 (September), pp. 601–18.

———, "The Recent Behavior of Business Fixed Investment in the United States and the Role of Computers," IMF Working Paper 89/97 (Washington: International Monetary Fund, 1989).

———, "National Savings and Targets for the Federal Budget Balance," in *Staff Studies for the World Economic Outlook,* World Economic Financial Surveys (Washington: International Monetary Fund, forthcoming, 1990).

Feldstein, Martin S., "Social Security, Induced Retirement, and Aggregate Capital Accumulation," *Journal of Political Economy,* Vol. 82 (September/October 1974), pp. 905–26.

———, "The Social Security Explosion," *The Public Interest,* Vol. 81 (1986), pp. 94–106.

Friend, Irwin, and Joel Hasbrouck, "Saving and After-Tax Rates of Return," *Review of Economics and Statistics,* Vol. 65 (November 1983), pp. 537–43.

Fries, Steven M., "Corporate Restructurings and Leverage—A Macroeconomic Perspective" (unpublished; Washington: International Monetary Fund, 1989).

Fukao, M., "Balance of Payments Imbalances and Long-Term Capital Movements" (unpublished; Tokyo: Bank of Japan, 1988).

Gravelle, Jane, "Capital Income Taxation and Efficiency in the Allocation of Investment," *National Tax Journal,* Vol. 36 (1983), pp. 297–306.

Greene, Geoffrey, "Demographics and the Decline in the Saving Rate," DRI/McGraw-Hill U.S. Long-Term Review (Fall 1989).

Hatsopoulos, George, Paul Krugman, and James Poterba, "Overconsumption: The Challenge to U.S. Economic Policy," report prepared for the American Business Conference (April 1989).

Hayashi, Fumio, "Why is Japan's Saving Rate So Apparently High?" in *NBER Macroeconomics Annual 1986,* ed. by Stanley Fischer (Cambridge, Massachusetts: MIT Press, 1986).

Hendershott, Patric H., and Joe Peek (1985a), "Household Saving: An Econometric Investigation," in *The Level and Composition of Household Saving,* ed. by Patric H. Hendershott (Cambridge, Massachusetts: Ballinger).

——— (1985b), "Real Household Capital Gains and Wealth Accumulation," *The Level and Composition of Household Saving,* ed. by Patric H. Hendershott (Cambridge, Massachusetts: Ballinger).

———, "Private Saving in the United States, 1950–85," NBER Working Paper 2294 (Cambridge, Massachusetts: National Bureau of Economic Research, June 1987).

Hendry, David F., "Econometric Modelling with Cointegrated Variables: An Overview," *Oxford Bulletin of Economics and Statistics,* Vol. 48 (1986), pp. 201–12.

———, A. R. Pagan, and J. D. Sargan, "Dynamic Specification," in *Handbook of Econometrics,* ed. by Zvi Griliches and Michael Intriligator (Amsterdam: North-Holland, 1984).

Hubbard, R. Glenn, "Uncertain Lifetimes, Pensions, and Individual Saving," NBER Working Paper 1363 (Cambridge, Massachusetts: National Bureau of Economic Research, 1984).

———, "Pension Wealth and Individual Saving: Some New Evidence," *Journal of Money, Credit, and Banking,* Vol. 18 (May 1986), pp. 167–78.

———, and Kenneth L. Judd, "Liquidity Constraints, Fiscal Policy, and Consumption," *Brookings Papers on Economic Activity: 1* (Washington: The Brookings Institution, 1986), pp. 1–50.

International Monetary Fund, *World Economic Outlook, A Survey by the Staff of the International Monetary Fund,* World Economic and Financial Surveys (Washington: International Monetary Fund, April 1988).

Jump, Gregory V., "Interest Rates, Inflation Expectations, and Spurious Elements in Measured Real Income and Saving," *American Economic Review,* Vol. 70 (December 1980), pp. 990–1004.

King, Mervyn, and Don Fullerton, *The Taxation of Income from Capital: A Comparative Study in the United States, the United Kingdom, Sweden, and West Germany* (Chicago: University of Chicago Press, 1984).

Kotlikoff, Laurence, "Health Expenditures and Precautionary Savings," NBER Working Paper 2008 (Cambridge, Massachusetts: National Bureau of Economic Research, August 1986).

———, "Some Macro Implications of Aging Populations," (unpublished; Boston, Massachusetts: Boston University, 1989).

———, and Avia Spivak, "The Family as an Incomplete Annuities Market," *Journal of Political Economy,* Vol. 89 (April 1981), pp. 372–91.

Lipsey, Robert E., and Irving B. Kravis, "Is the United States a Spendthrift Nation?" NBER Working Paper 2274 (Cambridge, Massachusetts: National Bureau of Economic Research, June 1987).

Masson, Paul R., and Ralph Tryon, "Macroeconomic Effects of Projected Population Aging in Industrial Countries," *Staff Papers,* International Monetary Fund (Washington), Vol. 37 (September 1990), pp. 453–85.

Montgomery, Edward, "Where Did All the Saving Go? A Look at the Recent Decline in the Personal Saving Rate," *Economic Enquiry,* Vol. 24 (October 1986), pp. 681–97.

Organization for Economic Cooperation and Development, *U.S. Economic Survey 1979* (Paris: OECD, 1979).

Sandmo, Agnar, "The Effect of Uncertainty on Saving Decisions," *Review of Economic Studies,* Vol. 37 (1970), pp. 353–60.

Shoven, John B., "Saving in the U.S. Economy," in *Removing Obstacles to Economic Growth,* ed. by Michael L. Wachter and Susan M. Wachter (Philadelphia: University of Pennsylvania Press, 1984).

Smith, Roger S., "Factors Affecting Saving, Policy Tools, and Tax Reform: A Review," *Staff Papers,* International Monetary Fund (Washington), Vol. 37 (March 1990), pp. 1–70.

Sturm, Peter H., "Determinants of Saving: Theory and Evidence," *OECD Economic Studies,* Vol. 1 (Autumn 1983), pp. 148–96.

Summers, Lawrence H., "Taxation and Capital Accumulation in a Life Cycle Growth Model," *American Economic Review,* Vol. 71 (September 1978), pp. 533–44.

———, and Chris Carroll (1987a), "Why Is U.S. National Saving So Low?" *Brookings Papers on Economic Activity:2* (Washington: The Brookings Institution), pp. 607–42.

——— (1987b), "Why Have Private Savings Rates in the United States and Canada Diverged?" *Journal of Monetary Economics,* Vol. 20 (September), pp. 249–79.

Tanzi, Vito, and A. Lans Bovenberg, "Economic Interdependence and the International Implications of Supply-Side Policies," in *A Supply-Side Agenda for Germany*, ed. by Gerhard Fels and George M. von Furstenberg (New York: Springer-Verlag, 1989).

United States, *Economic Report of the President* with *The Annual Report of the Council of Economic Advisers* (Washington: Government Printing Office, 1987).